

TAXONOMIC STATUS OF *GAMOCHAETA* (ASTERACEAE: INULEAE)
AND THE SPECIES OF THE UNITED STATES

Guy L. Nesom

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

Gamochaeta is maintained as a separate genus apart from *Gnaphalium*. Descriptions, synonymy, general geographic ranges and a key are given for the six species of *Gamochaeta* that occur in the United States: *G. americana* (Miller) Wedd., *G. falcata* (Lam.) Cabrera, *G. pennsylvanica* (Willd.) Cabrera, *G. purpurea* (L.) Cabrera, *G. sphacilata* (Kunth) Cabrera and *G. ustulata* (Nutt.) Nesom. The last species has been generally considered to be a synonym of *G. purpurea*, but it is a distinctive endemic of the Pacific coast from California to southwestern British Columbia.

KEY WORDS: *Gamochaeta*, *Gnaphalium*, Inuleae, United States.

The distinctiveness of *Gamochaeta* from *Gnaphalium* has been emphasized recently, primarily by Cabrera (1961 and later floristic treatments of South American species; e.g., 1971; 1978). Cabrera, however, provided almost no discussion to substantiate his taxonomy and in other treatments of the Gnaphaliinae, *Gamochaeta* has been recognized as a subgroup of *Gnaphalium* (Wagenitz 1965; Drury 1971; Hilliard & Burt 1981; but see Holub 1976). The primary comparative morphological study to include *Gamochaeta* has been that of Drury (1970), who found it to be a distinctive group within the species he sampled, although he retained it as a subgroup of *Gnaphalium* within his GROUP I (the "gnaphalioid cudweeds").

In a study of southern African taxa of Gnaphaliinae, primarily emphasizing characters of the phyllary stereome, achenial pubescence and leaf margins, Hilliard & Burt (1981) have suggested that the circumscription of *Gnaphalium* (as typified by *G. uliginosum* L.) be sharply restricted, and most of its species are native to Africa. Although they segregated numerous genera from *Gnaphalium* in Africa, and regard many of the traditional North American taxa as the genus *Pseudognaphalium* Kirpinczn., they tentatively retained *Gamochaeta* within *Gnaphalium*, while acknowledging that the achenial hairs of the two groups appear to be different.

Although *Gamochaeta* may be related to *Gnaphalium* sensu stricto (sensu Hilliard & Burt 1981), the characters that separate it from that group are at least as significant as those used to distinguish other generally accepted, seemingly closely related genera (e.g., those centered around *Filago* and *Psilocarphus*) and those features used to split a number of the small genera recently proposed in southern Africa. Plants of *Gamochaeta* are morphologically distinguished by their combination of small heads in a spiciform capitulescence, few (2-5) hermaphroditic flowers per head, blunt-truncate collecting appendages of the disc flower style branches, monomorphic, eciliate, pappus bristles basally connate in a distinctive manner and achenes with mucilage producing, rounded-conic hairs. In addition, the peculiar and very prominent concavity developed in the post fruiting receptacles, a feature not previously noted as distinctive of the group, appears to be rare elsewhere in the Gnaphaliinae. The generic identity of plants of *Gamochaeta* is immediately recognizable, and there are no species dubiously included or excluded from it.

Plants of *Gnaphalium* sensu stricto have basally caducous bristles and in some species the bristles are partially to wholly connected at the base, but they remain more or less discrete, joined by short, interlocking cilia ("patent" cilia, in the terminology of Hilliard & Burt 1981) originating from near the bristle base. In *Gamochaeta*, the bristles are always completely fused into a basal cylinder of more or less quadrate cells, the individual bristles having no separate identity. The achenial trichomes of *Gnaphalium* are 3 celled, longer than wide though variable in length, and among the species I have examined, variable in their release of mucilage. All species of *Gamochaeta* uniformly have trichomes as wide as long and composed of two even sized cells that always open to release mucilage.

Two species of *Gnaphalium* sensu stricto often produce a spiciform capitulescence: *G. pauciflorum* DC., of South Africa, sometimes with basally fused pappus bristles and *Gnaphalium polycaulon* Pers., a pan-tropical weed with separate pappus bristles (included by Drury 1970, as *G. indicum* L.). In the New World, the latter is sometimes mistakenly identified as *Gamochaeta*, apparently because of its general aspect. According to Hilliard (1981: p. 290), however, even between *G. pauciflorum*, which among the species of *Gnaphalium* sensu stricto appears to be most similar to *Gamochaeta*, the similarities are not homologous. "Both the form of the pappus and the type of basal fusion in *G. pauciflorum* is different from that in sect. *Gamochaeta*; the involucre bracts too are different in form and texture: there is no relationship here."

Despite these constant, but seemingly small differences, the overall resemblance between *Gnaphalium* sensu stricto and *Gamochaeta* is striking. Without an overview of the subtribe, the two might still be treated as congeneric. Based on observations by Dr. Michael Dillon (in prep.) of details of achenial vestiture and pappus, however, the closest relatives of *Gamochaeta* are South American taxa rather than *Gnaphalium*, and *Gamochaeta* should be treated

as a distinct genus. The analysis by Anderberg (1989) also has emphasized the distinctive trichome morphology of *Gamochaeta* in placing it in a lineage separate from that of true *Gnaphalium*.

The observation that *Gamochaeta* is not the sister group of *Gnaphalium* sensu stricto supports the hypothesis of Hilliard & Burt (1981: p. 227) that "there are no taxonomic links across the southern oceans . . . The regional developments of endemic genera with the Gnaphaliinae appear to be quite independent of one another." The coherent geographic distribution of *Gamochaeta* in the New World (natively) is distinctive. *Gnaphalium* sensu stricto primarily comprises a group of species mostly native to Africa. Only a few are native to North and Central America, although several others occur as naturalized weeds.

Omalotheca Cass. is the only other group besides *Gamochaeta* with spiciform capitulescences and basally fused pappus bristles that has sometimes been included in *Gnaphalium*. These plants are primarily Eurasian, boreal-alpine, rhizomatous perennials with very different achenial, floral and phyllary morphology; the resemblance is superficial and they appear to be only remotely related to *Gamochaeta* (Nesom 1990).

Gamochaeta comprises about 25-35 species (Cabrera 1961; but about 80 species, Cabrera 1978), which are mostly restricted in their native range to South America, with only 5-6 apparently native to North America, including México and Central America (Nesom, in prep). There are no autochthonous Old World taxa. A number of the annual species have strongly weedy tendencies and occur outside of their native areas.

The species of *Gamochaeta* are separated by differences primarily in duration, leaf shape, distribution of pubescence, and the morphology of the capitulescence and phyllaries. Small morphological differences between taxa are typical, but the taxa accepted here can usually be identified with little problem, especially if a set of correctly named reference specimens is at hand. The treatment of southeastern United States *Gamochaeta* as a single species (Cronquist 1980) is too conservative; that of Godfrey (1958) is nearly the same as presented here. At the other extreme, Cabrera (1961), whose species concept apparently is extremely narrow, recognized many names that appear to be synonyms. There is no means of identifying South American specimens that are from outside the southeastern part of the continent, and a comprehensive study of the entire genus is badly needed.

Drury (1971) noted that difficulties in the identification of species of *Gamochaeta* are associated with the lack of "strong correlations among their gross structural features." As further summarized by Drury, there is no evidence for apomixis in the genus, but the small, essentially closed heads with few staminate flowers suggest that they may be autogamous. Such a breeding system might account for at least part of the variability and proliferation of names. Another factor contributing to the difficult taxonomy seems to be an overly

typological approach to recognizing species. Closely similar taxa separated chiefly by differences in length or degree of interruptedness of the capitulescence, or by leaf shape or persistence of basal leaves, should be suspected of being conspecific, at least as a null hypothesis. Such features appear to be highly variable among plants within even a small area.

In the course of taxonomic studies of the Mexican and Texan species of *Gnaphalium* *sensu lato*, it became clear that the application of names to North American "gamochaetoid" species has been extremely uneven. The following summarizes my conclusions regarding the species present in the United States and their identities. These also are the most abundant ones in México, although several others occur there sporadically as waifs. Because of the weedy nature of these taxa, they probably can be expected to occur over a wider area than I have documented here, based on specimens from LL and TEX.

The synonymy below includes only names that apply to North American collections. As noted below, the application of some of the names is still equivocal, and a future study of historical type specimens may require readjustment of some of them. This treatment, however, which is based on examination of specimens from all of the United States, México, Central America and the West Indies, should at least provide a firmer basis for evaluating the nomenclature.

Gamochaeta Wedd., *Chl. And.* 1:151. 1855. Type species: *Gamochaeta* (*Gnaphalium*) *americana* (Miller) Wedd. *Gnaphalium* sect. *Gamochaeta* (Wedd.) O. Hoffm., *Nat. Pflanzenfam.* 4, 5:188. 1894. *Gnaphalium* subg. *Gamochaeta* (Wedd.) Gren., *Fl. Ch. Jurass* 427. 1869.

Taprooted or fibrous rooted annuals or perennials, sometimes rhizomatous, with erect to procumbent or decumbent stems, eglandular, at least stems and leaves densely and closely woolly, the leaves often with glabrescent upper surfaces. Leaves linear to spatulate with entire, flat margins, sessile to subclasping. Heads heterogamous, in a continuous or interrupted spicate capitulescence, in few headed individuals, reduced to a compact terminal glomerule; phyllaries graduated in 5-7 series, at least the inner with an undivided and nonfenestrated stereome; sometimes purplish tinted on the apex and margins; receptacles naked, prominently concave at post fruiting. Pistillate flowers fertile, numerous in several series, the corollas filiform-tubular. Hermaphroditic flowers fertile, 2-5, the corollas narrowly tubular with lobes erect or reflexed; collecting appendages of the style branches mostly blunt-truncated. Achenes 0.4-0.9 mm long, the epidermal surfaces smooth, with mucilage producing, rounded-conic hairs as wide as long; pappus monomorphic, of basally fused, eciliate, scabrid bristles basally caducous and released as a unit. A chromosome number of $n=14$ pairs have been reported for some of the species, with several reports of $n=7$ pairs for *G. purpurea*. Until voucher specimens have been examined, however, association of numbers with names should be suspect.

KEY TO THE SPECIES

1. Plants strongly perennial from thick, lateral rhizomes *G. ustulata*
- 1' Plants annual or biennial from a slender taproot or fibrous roots, without rhizomes (2)
 2. Leaves strongly to weakly bicolored with greenish glabrescent upper surfaces, spatulate-obovate to oblanceolate, the basal present or absent at flowering (4)
 - 2' Leaves equally gray-green pubescent above and beneath, not bicolored, linear to narrowly oblanceolate; basal leaves absent at flowering (3)
3. Bracteal leaves of capitulescence arcuate and more or less at right angles to the spike; inner phyllaries with distinctly brown apices, the outer with acuminate-attenuate apices *G. sphacilata*
- 3' Bracteal leaves of capitulescence straight and ascending; phyllaries distinctly brown, the inner with brown tips and the outer often completely brownish, the outer with acute to rounded apices *G. falcata*
 4. Phyllaries completely glabrous, the outermost broadly ovate, usually with an obtuse apex *G. americana*
 - 4' Outer phyllaries densely to lightly woolly at the base, the outermost ovate-triangular, with an acute to acute-acuminate apex (5)
5. Cauline leaves obovate-spatulate, weakly bicolored; capitulescence usually interrupted; outer phyllaries ovate-triangular with acuminate-apiculate apices, the inner 3.0-3.5 mm long, not apiculate; receptacles deeply concave or crateriform *G. pensylvanica*
- 5' Cauline leaves mostly oblanceolate, strongly bicolored; capitulescence usually continuous; outer phyllaries ovate-triangular with an acute apex; the inner (3.5-)4.0-5.0 mm long, usually with a minute but distinctly keeled apiculum; receptacles concave but not deeply *G. purpurea*

TAXONOMIC SUMMARY

1. *Gamochaeta americana* (Miller) Wedd., *Chlor. And.* 1:151. 1856. BASIONYM: *Gnaphalium americanum* Miller, *Gard. Dict.*, ed. 8, *Gnaphalium* no. 17. 1768. TYPE: JAMAICA. "Sloan. Cat. Jam. 125," not seen. Cabrera (1961) cited "Houstoun, 1731" (BM) as the type. *Gnaphalium purpureum* L. var. *americanum* (Miller) Klatt, *Linnaea* 42:140. 1878.

Gnaphalium guatemalense Gandoger, Bull. Soc. Bot. France 65:42. 1918.
TYPE: GUATEMALA, not seen. As synonym *fide* Nash 1976.
Gamochaeta guatemalensis (Gandoger) Cabrera, Bol. Soc. Argent.
Bot. 9:371. 1961.

Gnaphalium spicatum Lam., *Encycl. Method.* 2:757. 1786. TYPE:
URUGUAY. Montevideo, *Commerson s.n.*, not seen. Cabrera (1961)
cited as the type, a specimen from P, "Des environs de Buenos
Aires ... Commerson." Not *G. spicatum* Miller, *Gard. Dict.*, ed.
8, *Gnaphalium* no. 24. 1768, which apparently is *Pterocaulon vir-*
gatum (L.) DC. *Gamochaeta spicata* (Lam.) Cabrera, Bol. Soc.
Argent. Bot. 9:380. 1961. *Gnaphalium purpureum* L. var. *spicatum*
(Lam.) Klatt, *Linnaea* 42:140. 1878; not (Lam.) Baker 1882.

Annuals or biennials. Leaves spatulate to oblanceolate-obovate, often apiculate, distinctly bicolored, the basal often persistent, the cauline continuing into the lower part of the capitulescence. Capitulescence usually dense and continuous, less commonly interrupted, variable in length from 2-20 cm. Phyllaries completely glabrous, shiny, sometimes purple tinged, the outermost ovate with rounded to obtuse or slightly acute apices, ca 1/3-1/2 as long as the inner, the innermost 3.5-4.0 mm long, with distinctly brown hyaline terminal appendages with a rounded to blunt apex. Chromosome number, $n=14$ pairs.

Apparently adventive and uncommon in near coastal localities in the southeastern United States, specimens seen from Texas, Mississippi, Alabama, Florida, Georgia, South Carolina and North Carolina, one from California (Humboldt Co. *Tracy 15057*, TEX), widespread in western to central and southern México, through Central America, West Indies, South America; (January-April-November).

This species is easily recognized by its strongly bicolored leaves and shiny, completely glabrous phyllaries, the outer broadly ovate. *Gamochaeta purpurea* is distinguished from *G. americana* in its inner phyllaries more commonly purple tinged and with translucent to slightly brownish, minutely but distinctly apiculate apices and its ovate-triangular outer phyllaries 1/2-2/3 as long as the inner and with lightly woolly bases.

The couplet provided by Adams (1972) to separate *Gamochaeta americana* and *G. purpurea* in Jamaica, almost certainly referred to *G. americana* (the type from Jamaica) and what is treated here as *G. pensylvanica*. Adams (1972) recognized only two taxa from Jamaica, and I have seen only specimens of *G. americana* and *G. pensylvanica* from that island. The taxon from New Zealand identified by Drury (1971) as *Gnaphalium spicatum* is very clearly what is treated here as *Gamochaeta americana*, as are the illustrations and description of *G. spicata* provided by Cabrera (1971; 1978). The identity of what both Cabrera and Drury have called "*Gnaphalium americanum*" is not clear, although it appears very similar to what is called here *G. purpurea*. Cabrera

apparently has not identified the latter from southeastern South America, but several Brazilian specimens at LL-TEX are identical to *G. purpurea* of the eastern United States; Drury, however, included both *G. purpurea* and "*G. americana*" among the New Zealand adventives.

For whatever reason, should *Gnaphalium spicatum* prove to be a species separate from *G. americanum*, another name for the former will be necessary, because Larmarck's *G. spicatum* is illegitimate as a later homonym, following 18 years after the publication of the same name by P. Miller (see citation above).

2. *Gamochaeta falcata* (Lam.) Cabrera, Bol. Soc. Argent. Bot. 9:370. 1961. BASIONYM: *Gnaphalium falcatum* Lam., *Encycl. Method.* 2:758. 1786. TYPE: URUGUAY. Montevideo, *Commerson s.n.*, not seen. *Gnaphalium purpureum* L. var. (β) *falcatum* (Lam.) Torr. & Gray, *Fl. N. Amer.* 2:428. 1843. *Gnaphalium stachydifolium* Lam. var. *falcatum* (Lam.) Klatt, *Linnaea* 42:140. 1878.

Gnaphalium heteroides Klatt, *Linnaea* 42:137. 1878. TYPE: MÉXICO. Locality unspecified, *Ehrenberg* 972 (GH-fragment and drawings!).

Gnaphalium stagnale I.M. Johnston, *Contr. Gray Herb.*, ser. 2, 68:99. 1923. TYPE: MÉXICO. San Luis Potosí: Marshes about San Luis Potosí, Aug 1876, *Schaffner* 225 (HOLOTYPE: GH!).

Gnaphalium calviceps Fernald, *Rhodora* 37:449. 1935. TYPE: UNITED STATES. Virginia: Princess Anne Co., Cape Henry, The Desert, sandy pinelands, 28-29 Jul 1934, *Fernald & Long* 4245 (HOLOTYPE: GH; Isotype: LL!).

Gnaphalium subfalcatum Cabrera, *Revista Mus. La Plata Bot.*, ser. 2, 4:174. 1941. TYPE: ARGENTINA, not seen. *Gamochaeta subfalcata* (Cabrera) Cabrera, *Bol. Soc. Argent. Bot.* 9:370. 1961.

Annuals. Stems with erect to procumbent, 6-40 cm tall. Leaves equally pubescent above and beneath, not at all bicolored, linear or narrowly lanceolate with the lower often oblanceolate, 2-3 cm long, 2.0-3.5(-5.0) mm wide, the upper commonly but not always folded. Capitulescence continuous, less commonly strongly interrupted, equally leafy from bottom to top or the leaves reduced in length above the middle. Phyllaries lanceolate with narrowly to broadly acute or rounded apices, basally woolly or at least basally submerged in wool of subtending leaves or bracts, sometimes rose tinged, the inner with hyaline apices merely tinged with brown.

Common from southeastern Texas to Florida and north to Virginia along the Atlantic coast, rare and adventive in southern Arizona and California, in México scattered mostly in the northwest, abundant in South America and perhaps native there, also adventive in Europe; commonly in open, sandy

soil, arroyos, river and pond banks, other disturbed habitats; February-July (-August).

Gamochaeta falcata is distinctive in its relatively narrow, gray-green leaves that are equally pubescent above and beneath, usually with the upper sharply folded and in its leafy capitulescence. The degree of variation in leaf shape in a single species in the eastern United States appears to be great enough to account for the small differences said to exist between *G. falcata*, *G. subfalcata* and *G. calviceps*. Cabrera (1961; 1978) has identified plants of both *G. calviceps* and *G. subfalcata* from North America, separated by the degree of thickness and continuousness of the spikes, features I find variable and intergrading. Godfrey (1958) also recognized *G. falcata* and *G. calviceps* as distinct, but primarily on the basis of phyllary pubescence. The leaves are usually linear but vary toward oblanceolate. South American collections of *G. subfalcata* and *G. falcata* from Uruguay also appear to be variable and fall within the range observed for those from North America. It is on this basis that I consider these three taxa conspecific.

Gnaphalium heteroides is tentatively included here as a synonym. Although it is definitely a species of *Gamochaeta*, it is atypical of *G. falcata* in its smaller stature and smaller, more obovate-spatulate leaves. It might represent a depauperate individual of *G. falcata*, or it might be a South American species adventive in México. I have seen no other specimens from México that are a close match to the type specimen from GH.

3. *Gamochaeta pensylvanica* (Willd.) Cabrera, Bol. Soc. Argent. Bot. 9:375. 1961. BASIONYM: *Gnaphalium pensylvanicum* Willd., Enum. Hort. Berol. 867. 1809. TYPE: UNITED STATES. Pennsylvania: not seen.

Gnaphalium spathulatum Lam., Encycl. Method. 2:758. 1786. TYPE: ARGENTINA. Near Buenos Aires, Commerson s.n., not seen; not Burm. f. 1768 or Phil. 1895. *Gnaphalium purpureum* L. var. *spathulatum* (Lam.) Baker in Martius, Fl. Brasil. 6:125. 1882; Not *Gnaphalium purpureum* L. var. *spathulatum* (Lam.) Ahles 1964.

Gnaphalium peregrinum Fernald, Rhodora 45:479. 1943. TYPE: UNITED STATES. Louisiana: Rapides Parish, N edge of Pineville, burnt-over pine-scrub oak sandhills, 30 Jul 1938, D.S. & H.B. Correll 9937 (HOLOTYPE: GH, photo! Rhodora 45:pl. 479. 1943). Proposed by Fernald to replace the later homonym *Gnaphalium spathulatum* Lam.

Annuals. Stems erect to procumbent, 10-50 cm tall. Leaves usually oblanceolate to obovate-spatulate and basally narrowed to a petiolar region, often apiculate and with closely sinuate margins, the lower 2-7 cm long, 4-16 mm wide, weakly bicolored, the basal and lowermost usually persistent, similarly

shaped cauline leaves continuing into at least the lower part of the capitulescence. Capitulescence continuous or usually strongly interrupted, with heads in short axillary to lateral glomerules; phyllaries often purple tinged, the outer basally woolly or partially buried in the wool of subtending bracts, ovate-triangular with attenuate-apiculate apices, $1/2-2/3$ as long as the inner, the inner 3.0-3.5 mm long, narrowly triangular to lanceolate with acute to obtuse, transparent or often with a golden sheen; receptacles deeply concave to crateriform, the centermost portion pronouncedly deep. Corollas usually with purple tips. Chromosome number, $n=14$ pairs.

South Texas to Florida and north, mostly along the Atlantic coast, the populations in northeastern México continuous with those of Texas, scattered in northern to central México, Nicaragua, widespread in South America, West Indies, Hawaii, Japan, Germany; commonly in disturbed habitats, often in areas of oak or pine woodlands; January-November or probably all year.

Recognized by its weakly bicolored, loosely woolly, obovate-spatulate leaves, similarly shaped ones continuing into at least the basal part of the capitulescence, which is usually strongly interrupted, its outer phyllaries basally woolly with very thin, acuminate-attenuate apices, and by its deeply crateriform receptacles.

4. *Gnaphaeta purpurea* (L.) Cabrera, Bol. Soc. Argent. Bot. 9:377. 1961. BASIONYM: *Gnaphalium purpureum* L., Sp. Pl. 854. 1753. TYPE: UNITED STATES. "Carolina, Virginia, Pensylvania," *Kalm s.n.* (TYPE?: LINN fiche!).

Gnaphalium rosaceum I.M. Johnston, Contr. Gray Herb., ser. 2, 68:99. 1923. TYPE: MÉXICO. San Luis Potosí: Region of San Luis Potosí, 1878, Parry & Palmer 426 (HOLOTYPE: GH!).

Annuals or biennials. Stems erect to procumbent, 10-35 cm tall. Leaves oblanceolate, without a prominent petiolar region, often with closely sinuate margins, usually strongly bicolored, the lower 2-7 cm long, 7-16 mm wide, the basal and lowermost usually persistent, similarly shaped cauline leaves continuing into at least the lower part of the capitulescence. Heads usually in a continuous, or less commonly interrupted, capitulescence; phyllaries often purple tinged, the inner (3.5-)4.0-5.0 mm long, mostly lanceolate with acute to obtuse or rounded apices, the outer lightly woolly basally, ovate-triangular with acute apices, $1/2-2/3$ as long as the inner; receptacles concave but not deeply so. Corollas usually with purple tips. Chromosome number, $n=7$, 14 pairs.

Common and widespread in the eastern United States from eastern Texas to Florida, north to Kansas, Missouri, Michigan and New England, apparently disjunct to California and Oregon (see comments below), very scattered and apparently adventive elsewhere in the western United States, uncommon and

apparently adventive but scattered through México, Hawaii, New Zealand, South America (Brazil); weedy habitats; April-July(-August).

Gamochaeta purpurea is often confused with *G. pensylvanica* and *G. americana*, but it is probably most closely related to the latter, in its strongly bi-colored and thicker leaves, more condensed and typically uninterrupted spikes, and its relatively thick and shiny phyllaries. In the key above, however, it is contrasted with the former because of their similarity in the basally woolly, acute outer phyllaries and, in México, their tendency to produce purple pigments in the phyllaries and corolla tips. In the southeastern United States, plants of *G. americana* often have purplish phyllaries, though color is usually lacking in plants of México. Besides the differences noted in the couplet, the leaves and phyllaries of *G. pensylvanica* are much thinner textured than those of *G. purpurea*.

The plants of California and Oregon are essentially disjunct from those of the eastern United States and different in their slightly but distinctively narrower phyllaries with a thicker, more sharply differentiated stereome and longer, browner, hyaline apices. These ultimately may be found to have a different name or be undescribed, but their similarity to typical *Gamochaeta purpurea* is too great to add yet another new name without a more detailed study.

5. *Gamochaeta sphacilata* (Kunth) Cabrera, Bol. Soc. Argent. Bot. 9:380. 1961. BASIONYM: *Gnaphalium sphacilatum* Kunth, Nov. Gen. & Sp. 4[folio]:67. 1818; 4[quarto]:86. 1820. TYPE: MÉXICO. Edo. México: between México and Huehuetoca, *Humboldt & Bonpland s.n.* (HOLOTYPE: P fiche!). *Gnaphalium purpureum* L. var. *sphacilatum* (Kunth) Speg., Revist. Agron. La Plata 3:533. 1897. *Gnaphalium stachydifolium* Lam. var. *sphacilatum* (Kunth) Reiche, Anal. Univ. Chile 112:124. 1903.

Gnaphalium pedunculatum I.M. Johnston, Contr. Gray Herb., ser. 2, 68:99. 1923. TYPE: MÉXICO. Durango: Otinapa, 1906, *Palmer 411* (HOLOTYPE: GH!, photo! in *Rhodora* 37:449. 1935; Isotype: F!).

Annuals or biennials. Stems erect to ascending, 10-32 cm tall. Leaves linear to narrowly oblanceolate, 1-4 cm long, 1-3(-5) mm wide, the upper often folded, grayish to whitish green and evenly woolly above and beneath, the basal absent at flowering, the cauline continuing the whole length of the capitulescence, long, arcuate-spreading and standing nearly at right angles to the spike. Heads in a strongly interrupted spicate capitulescence of glomerules, axillary or on short, lateral branches, sometimes reduced to only a single, compact, terminal glomerule; outer phyllaries basally woolly or partly submerged in wool of subtending bracts, apically acuminate-attenuate, 1/2-2/3 as long

as the inner, the inner 4.0-5.0 mm long, brown tipped, the middle usually completely brownish.

In the United States known to me only by two collections from Jeff Davis county in the trans-Pecos area of Texas (*Turner 15546A* and *Worthington 14344*, both TEX), also western to south central México, similar plants seen from Colombia in northwest South America; often in area of pine-oak woods, openings or pastures; July-October. Cabrera (1978) included *Gamochaeta spachilata* in the flora of Argentina.

Gamochaeta spachilata is similar to *G. falcatum*, which also has narrow, gray-green leaves, equally pubescent above and beneath. As treated here, *G. spachilatum* has whiter vestiture, a much more interrupted capitulescence with long, arcuate-spreading bracteal leaves, at least the phyllary apices dark brown, the middle phyllaries often completely brown, giving the whole capitulescence a dark color and the outer phyllaries with acuminate-attenuate apices. Further, *G. spachilatum* apparently is less weedy than *G. falcatum* and occurs in rocky, rather than sandy habitats.

6. *Gamochaeta ustulata* (Nutt.) Nesom, *comb. nov.* BASIONYM: *Gnaphalium ustulatum* Nutt., Trans. Amer. Philos. Soc., ser. 2, 7:404. 1841. LECTOTYPE (here designated): UNITED STATES. California: "Near St. Barbara in Upper California," *Nuttall s.n.* (BM-photo at GH!). *Gnaphalium purpureum* L. var. *ustulatum* (Nutt.) Boivin, Naturaliste Canad. 87:34. 1960. Nuttall also cited a specimen from "On the plains of the Platte, towards the rocky Mountains," but the California plant is the only one that could fit the description (see discussion below).

Gnaphalium pannosum Gandoger, Bull. Soc. Bot. France 65:42. 1918. TYPE: UNITED STATES. Washington: not seen; not Schultz-Bip. 1845 or A. Gray 1883. As a synonym of *Gnaphalium ustulatum* fide Ferris (1959) and Drury (1971).

Perennial herbs from a relatively thick, horizontal, fibrous rooted rhizome. Stems 12-20 cm tall, densely white tomentose. Leaves obovate-spatulate, 2-5 cm long, 6-16 mm wide, densely and closely tomentose above and beneath but less so and darker colored above, the upper surface sometimes but not commonly glabrate, the basal persistent, cauline gradually reduced upward, continuing into only the basal part of the capitulescence. Heads in a dense, thick, uninterrupted, terminal spike or glomerule 1-6 cm long; phyllaries often all yellowish brown, darker at the apex, sometimes slightly purple tinged, the innermost 4-5 mm long, with apiculate apices, the outermost half as long, lightly woolly basally.

California in Santa Barbara and San Luis Obispo counties northward along the coast to Washington, Oregon and southwestern British Columbia, natural-

ized in New Zealand; various habitats very near the coast, dry hills, grasslands, sand hills, sandy ledges of cliffs in the spray zone; April-July.

As pointed out by Drury (1971), *Gamochaeta ustulata* has been overlooked by all recent Pacific coast floristicians, who have either completely deleted Nuttall's name or referred to it as a synonym of *G. purpurea*. Johnston (1924) argued that the species was separate from the latter on the basis of "gross habit and aspect," but his distinction apparently was not critical enough to be convincing. *Gamochaeta ustulata*, however, is an easy species to recognize, in that it is the only rhizomatous, truly perennial *Gamochaeta* in North America and has thicker leaves with a denser and more closely packed lower tomentum and browner, broader phyllaries than any other species with which it might be confused.

Nuttall's description of *Gnaphalium ustulatum* as perennial (" "), with leaves "whitely tomentose on both surfaces" leaves little doubt as to its true identity. Its closest relative may be *Gamochaeta stachydifolia* (Lam.) Cabrera, of Brazil, Uruguay and Argentina, which has a similar duration, habit and vestiture.

Drury (1971), whose illustration unequivocally shows the rhizomatous nature of the plants, saw specimens from California and British Columbia (Vancouver Island); there are specimens at LL-TEX from California, Oregon and Washington.

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